

Claim 19 relates to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas. Claim 19 recites that the method includes precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching, and adding a fluorine-delivering etching gas at least from time to time to the process gas, the fluorine-delivering etching gas including at least a compound selected from the group consisting of  $\text{ClF}_3$ ,  $\text{BrF}_3$  and  $\text{IF}_5$ .

Claim 24 is relates to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas. Claim 24 recites that the method includes precipitating at least one passivating material at least on a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching, and adding  $\text{NF}_3$  to the process gas as an additive for consuming at least one of the at least one passivating material,  $\text{SiO}_2$  and a fluoropolymer material.

The Final Office Action alleges at pages 2 to 3 that:

Flamm teaches a method of anisotropic plasma etching a laterally defined structure in as [sic] silicon substrate using a process gas. Flamm teaches adding a fluorine-delivering etching gas to the process gas. The fluorine-delivering etching gas may include  $\text{NF}_3$ ,  $\text{ClF}_3$  or  $\text{BrF}_3$  . . . . Flamm also teaches that plasma in a wide range of gas mixtures including  $\text{CF}_4$ ,  $\text{CF}_4/\text{O}_2$  and  $\text{C}_2\text{F}_6/\text{O}_2$  . . . can be used to supply fluorine atoms for selective isotropic silicon etching. The said gas mixtures can deposit polymer (so-called precipitating at least one passivating material in the instant claims), see page 2755, col. 1 and 2) [sic]. Because it is known that gas comprising  $\text{CF}_4$  or  $\text{C}_2\text{F}_6$  can supply fluorine atoms for selective isotropic silicon etching and deposit polymer and because it is disclosed by Flamm, hence, it would have been obvious to one with ordinary skill in the art to incorporate gas mixtures including  $\text{CF}_4/\text{O}_2$  and  $\text{C}_2\text{F}_6/\text{O}_2$  in the method of etching silicon using the fluorine-delivering etching gas including  $\text{NF}_3$ ,  $\text{ClF}_3$  or  $\text{BrF}_3$  . . . and use them in any combinations thereof in order to provide their art recognized advantages and produce an expected result since they have been taught to be useful for the same purpose (etching silicon substrate) see case law cited below. Also see Singh et al. (US 6,187,666) in the record as evidence for the prior "known" statement of depositing polymer as a protective layer (passivating material). Furthermore, Flamm teaches using  $\text{C}_2\text{F}_6$  in anisotropic etching of silicon as stated above , because same material is used in the same process as claimed, therefore it

would inherently contain same property such as a passivating material.

Applicants respectfully submit that Flamm et al. do not disclose, or even suggest, all of the limitations of claims 19 and 24. Claims 19 and 24 recite precipitating at least one passivating material at least on a side wall of the laterally defined structure. Flamm et al. do not disclose, or even suggest, a passivating material. The Final Office Action contends that the "polymer" described by Flamm et al. corresponds to the passivating material recited in claims 19 and 24. Flamm et al., however, do not disclose, or even suggest, that the "polymer" would have any passivating properties at all. For this reason alone, Flamm et al. do not disclose, or even suggest, all of the limitations of claims 19 and 24.

Moreover, Flamm et al. teach away from having the "polymer" used as a passivating material. Flamm et al. state that "there are specific side effects associated with many of these gases or gas mixtures that may be harmful or helpful in some processes. For example,  $\text{CF}_4$  plasmas can deposit polymer if they are 'loaded' with a large area of silicon, while pure  $\text{SF}_6$  plasmas form polymeric sulfur-containing films under heavily loaded conditions. Similarly, the presence of  $\text{CF}_x$  radicals in some fluorocarbon-based etchants is detrimental because they attack  $\text{SiO}_2$ ." Flamm et al. at page 2755. As described above,  $\text{CF}_x$  radicals are detrimental. Applicants respectfully further submit that the use of the word "similarly" indicates that the contents of the previous sentence are also detrimental. As a result,  $\text{CF}_4$  plasmas which deposit polymer if they are "loaded" with a large area of silicon, and pure  $\text{SF}_6$  plasmas which form polymeric sulfur-containing films under heavily loaded conditions are detrimental. Flamm et al. at pages 2755 to 2756. Applicants also infer from Flamm et al. that the polymers may attack the  $\text{SiO}_2$ , hence being further detrimental.

Applicants furthermore submit that U.S. Patent No. 6,187,666 ("Singh et al.") relied on by the Final Office Action to allegedly show what is "known" regarding depositing polymer as a protective layer, does not establish that "depositing polymer as a protective layer (passivating material)" was "known" at the time the present invention was made or at the time the present application was filed. In this regard, U.S. Patent No. 6,187,666 issued on **February 13, 2001** from Application Serial No. 09/328,148, filed on **June 8, 1999**. The present application has an international filing date of **March 16, 2000** and claims priority to German

Application No. 199 19 469.6, filed on April 29, 1999, which predates the filing date of U.S. Patent No. 6,187,666. A certified translation of German Application No. 199 19 469.6 is enclosed herewith. In view of the foregoing, it is respectfully submitted that U.S. Patent No. 6,187,666 fails to establish that "depositing polymer as a protective layer (passivating layer)" was "known" at the time the present invention was made or at the time the present application was filed. Withdrawal of any and all rejections based on any disclosure contained in U.S. Patent No. 6,187,666 is therefore respectfully requested.

Applicants further submit that Flamm et al. do not disclose, or even suggest, that the at least one passivating material is precipitated on at least one side wall. Flamm et al. do not disclose, or even suggest, placement of the polymer (and Applicants do not admit that the polymer corresponds to the passivating material) on at least the side of a laterally defined structure. Flamm et al., as seen in Figure 1, describe removing polysilicon material but do not disclose, or even suggest, precipitating that material on at least one side wall.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Flamm et al. do not disclose, or even suggest, the step of precipitating passivating material at least on a side wall of a laterally defined structure. It is therefore respectfully submitted that Flamm et al. do not render obvious claims 19 and 24.

It is respectfully submitted that the cases of In re Fine, supra, and In re Jones, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), make plain that the Final Office Action's generalized assertions that it would have been obvious to modify or combine the reference do not properly support a § 103 rejection. It is respectfully

submitted that those cases make plain that the Final Office Action reflects a subjective "obvious to try" standard, and therefore does not reflect the proper evidence to support an obviousness rejection based on the reference relied upon. In particular, the Court in the case of In re Fine stated that:

The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. This it has not done. . . .

**Instead, the Examiner relies on hindsight in reaching his obviousness determination. . . . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.**

In re Fine, 5 U.S.P.Q.2d at 1598 to 1600 (citations omitted; italics in original; emphasis added). Likewise, the Court in the case of In re Jones stated that:

Before the PTO may combine the disclosures of two or more prior art references in order to establish *prima facie* obviousness, there must be some suggestion for doing so, found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. . . .

**Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill . . . would have been motivated to make the modifications . . . necessary to arrive at the claimed [invention].**

In re Jones, 21 U.S.P.Q.2d at 1943, 1944 (citations omitted; italics in original).

That is exactly the case here since it is believed and respectfully submitted that the present Final Office Action offers no evidence whatsoever, but only conclusory hindsight, reconstruction and speculation, which these cases have indicated does not constitute evidence that will support a proper obviousness finding. Unsupported assertions are not evidence as to why a person having ordinary skill in the art would be motivated to modify the reference to provide the claimed subject matter of the claims to address the problems met thereby. Accordingly, the Office must provide proper evidence of a motivation for modifying the reference to provide the claimed subject matter.

As provided above, Flamm et al. teach away from having the "polymer" used as a passivating material. A person having ordinary skill in the art would not have been motivated to modify Flamm et al. in any way to provide the features of claims 19 and 24. The disclosure of U.S. Patent No. 6,187,666, which issued from a patent application filed after the priority date of the present application, does not provide either a sufficient motivation for modifying Flamm et al. or any indication of what was "known" at the time the present invention was made.

More recently, the Federal Circuit in the case of In re Kotzab has made plain that even if a claim concerns a "technologically simple concept" -- which is not the case here -- there still must be some finding as to the "specific understanding or principle within the knowledge of a skilled artisan" that would motivate a person having no knowledge of the claimed subject matter to "make the combination in the manner claimed," stating that:

In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor controlling multiple valves, as opposed to multiple sensors controlling multiple valves, is a technologically simple concept. With this simple concept in mind, the Patent and Trademark Office found prior art statements that in the abstract appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed. In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper prima facie case of obviousness in rejecting [the] claims . . . under 35 U.S.C. Section 103(a) over Evans.

In re Kotzab, 55 U.S.P.Q.2d 1313, 1318 (Fed. Cir. 2000) (emphasis added). Again, it is believed that there have been no such findings.

In summary, it is respectfully submitted that Flamm et al. do not render obvious claims 19 and 24.

As for claim 20 to 22, which depend from claim 19 and therefore include all of the limitations of claim 19, it is respectfully submitted that Flamm et al. do not render obvious these dependent claims for at least the same reasons given above in support of the patentability of claim 19. In re Fine, supra (any dependent claim that depends from a non-obvious independent claim is non-obvious).

As for claims 25 to 27, which depend from claim 24 and therefore include all of the limitations of claim 24, it is respectfully submitted that Flamm et al. do not render obvious these dependent claims for at least the same reasons given above in support of the patentability of claim 24. Id.

**III. Rejection of Claims 23 and 28 to 36 Under 35 U.S.C. § 103(a)**

Claims 23 and 28 to 36 were rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Flamm et al. and U.S. Patent No. 5,047,115 ("Charlet et al."). Applicants respectfully submit that the combination of Flamm et al. and Charlet et al. does not render obvious the present claims for the following reasons.

The Final Office Action contends that Charlet et al. discloses "that helium or argon . . . may be used in the process of etching silicon substrate so as to ensure the stability of the discharge and its extension to the substrate." Final Office Action at p. 5. The Final Office Action contends that "it would have been obvious to one with ordinary skill in the art to incorporate helium or argon as taught by Charlet in order to ensure the stability of the discharge and its extension to the substrate." Final Office Action at pp. 5 to 6. As an initial matter, it is noted that the Final Office Action does not even allege that it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the disclosures of Flamm et al. and Charlet et al. As set forth in 35 U.S.C. § 103(a), obviousness must be measured with reference to that which would have been obvious to a person having ordinary skill in the art at the time the invention was made. The failure of the Final Office Action to measure obviousness with reference to the time the invention was made is plainly indicative that the present rejection is based on nothing more than improper hindsight.

Claim 23 depends from claim 19 and therefore includes all of the limitations of claim 19, and claim 28 depends from claim 24 and therefore includes all of the limitations of claim 24. Charlet et al. do not disclose, or even suggest, precipitating at least one passivating material at least on a side wall, and therefore Charlet et al. do not cure the critical deficiencies of Flamm et al. with reference to claims 19 and 24. Therefore, the combination of Flamm et al. and Charlet et al. does not disclose, or even suggest, all of the limitations of claims 23 and 28. It is

therefore respectfully submitted that the combination of Flamm et al. and Charlet et al. does not render obvious claims 23 and 28.

Claim 29 relates to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas. Claim 29 recites precipitating a passivating material on at least one side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching, and adding at least one of H<sub>2</sub>, He and Ne to the process gas.

Claim 34 relates to a method of anisotropic plasma etching a laterally defined structure in a silicon substrate using a process gas. Claim 34 recites precipitating at least one passivating material on at least a side wall of the laterally defined structure at least one of prior to the anisotropic plasma etching and during the anisotropic plasma etching, adding at least one fluorine-delivering etching gas to the process gas, the at least one fluorine-delivering etching gas including at least one compound selected from the group consisting of ClF<sub>3</sub>, BrF<sub>3</sub> and IF<sub>5</sub>, adding NF<sub>3</sub> to the process gas as an additive for consuming the at least one passivating material, and adding at least one of H<sub>2</sub>, He, and Ne to the process gas.

As indicated above, each of claims 29 and 34 includes the step of precipitating at least one passivating material at least on a side wall of the laterally defined structure. As indicated above, the combination of Flamm et al. and Charlet et al. does not disclose, or even suggest, precipitating at least one passivating material at least on a side wall of the laterally defined structure. It is therefore respectfully submitted that the combination of Flamm et al. and Charlet et al. does not render obvious claims 29 and 34.

As for claims 30 to 33, which depend from claim 29 and therefore include all of the limitations of claim 29, it is respectfully submitted that the combination of Flamm et al. and Charlet et al. does not render obvious these dependent claims for at least the same reasons given above in support of the patentability of claim 29. In re Fine, supra.

As for claims 35 and 36, which depend from claim 34 and therefore include all of the limitations of claim 34, it is respectfully submitted that the combination of Flamm et al. and Charlet et al. does not render obvious these dependent claims for at least the same reasons given above in support of the patentability of claim 34. Id.

IV. Conclusion

It is therefore respectfully submitted that all of the presently pending claims are allowable. All issues raised by the Examiner having been addressed and an early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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